

CLAIMS

1. A transgenic tree cell transformed by an altered AHAS nucleic acid, wherein expression of the nucleic acid in the tree cell results in increased resistance to an imidazolinone herbicide as compared to a wild type variety of the tree cell.

2. The transgenic tree cell of Claim 1, wherein the tree is a member of a genus selected from the group consisting of a *Larix* genus and a *Populus* genus.

3. The transgenic tree cell of Claim 1, wherein the tree is a *Larix* species selected from the group consisting of: *Larix decidua*, *Larix lyallii*, *Larix kaempferi*, *Larix laricina*, *Larix occidentalis* and hybrids thereof.

4. The transgenic tree cell of Claim 1, wherein the tree is a *Populus* species selected from the group consisting of: *Populus angustifolia*, *Populus balsamifera*, *Populus canadensis*, *Populus deltoides*, *Populus fremontii*, *Populus grandidentata*, *Populus tremuloides*, *Populus trichocarpa* and hybrids thereof.

5. The transgenic tree cell of Claim 1, wherein the imidazolinone herbicide is selected from the group consisting of: 2-(4-isopropyl-4-methyl-5-oxo-2-imidiazolin-2-yl)-nicotinic acid, 2-(4-isopropyl)-4-methyl-5-oxo-2-imidazolin-2-yl)-3-quinolinecarboxylic acid, 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methylnicotinic acid, and a mixture of methyl 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluate, methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluate and any derivative thereof.

6. The transgenic tree cell of Claim 1, wherein the altered AHAS nucleic acid comprises a polynucleotide sequence selected from the group consisting of:

- a) a polynucleotide as shown in SEQ ID NO:1;
- b) a polynucleotide as shown in SEQ ID NO:2;
- c) a polynucleotide encoding a polypeptide as shown in SEQ ID NO:3;

d) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through c); and

e) a polynucleotide complementary to the polynucleotide of any of a) through d).

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7. The transgenic tree cell of Claim 1, wherein the altered AHAS nucleic acid comprises a polynucleotide as shown in SEQ ID NO:2.

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8. The transgenic tree cell of Claim 1, wherein the altered AHAS nucleic acid comprises a polynucleotide encoding a polypeptide as shown in SEQ ID NO:3.

9. A transgenic tree comprising a tree cell according to any of Claims 1-8, wherein expression of the nucleic acid in the tree results in the tree's increased resistance to an imidazolinone herbicide as compared to a wild type variety of the tree.

10. A seed produced by a transgenic tree comprising a tree cell according to any of Claims 1-8, wherein the seed is true breeding for an increased resistance to an imidazolinone herbicide as compared to a wild type variety of the seed.

11. A method of producing a transgenic tree cell with an increased resistance to an imidazolinone herbicide as compared to a wild type variety of the tree cell comprising, transforming the tree cell with an expression cassette comprising an altered AHAS nucleic acid.

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12. A method of producing a transgenic tree comprising,

(a) transforming a tree cell with an expression cassette comprising an altered AHAS nucleic acid, and

(b) generating a tree with an increased resistance to an imidazolinone herbicide from the tree cell.

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13. The method of Claim 11 or Claim 12, wherein the tree is a member of a genus selected from the group consisting of a Larix genus and a Populus genus.

14. The method of Claim 11 or Claim 12, wherein the tree is a *Larix* species selected from the group consisting of: *Larix decidua*, *Larix lyallii*, *Larix kaempferi*, *Larix laricina*, *Larix occidentalis* and hybrids thereof.

15. The method of Claim 11 or Claim 12, wherein the tree is a *Populus* species selected from the group consisting of: *Populus angustifolia*, *Populus balsamifera*, *Populus canadensis*, *Populus deltoides*, *Populus fremontii*, *Populus grandidentata*, *Populus tremuloides*, *Populus trichocarpa* and hybrids thereof.

16. The method of Claim 11 or Claim 12, wherein the imidazolinone herbicide is selected from the group consisting of: 2-(4-isopropyl-4-methyl-5-oxo-2-imidiazolin-2-yl)-nicotinic acid, 2-(4-isopropyl)-4-methyl-5-oxo-2-imidazolin-2-yl)-3-quinolinecarboxylic acid, 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methylnicotinic acid, and a mixture of methyl 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluate, methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluate and any derivative thereof.

17. The method of Claim 11 or Claim 12, wherein the altered AHAS nucleic acid comprises a polynucleotide sequence selected from the group consisting of:

- a) a polynucleotide as shown in SEQ ID NO:1;
- b) a polynucleotide as shown in SEQ ID NO:2;
- c) a polynucleotide encoding a polypeptide as shown in SEQ ID NO:3;
- d) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through c); and
- e) a polynucleotide complementary to the polynucleotide of any of a) through d).

18. The method of Claim 11 or Claim 12, wherein the altered AHAS nucleic acid comprises a polynucleotide as shown in SEQ ID NO:2.

19. The method of Claim 11 or Claim 12, wherein the altered AHAS nucleic acid comprises a polynucleotide encoding a polypeptide as shown in SEQ ID NO:3.

20. The method of Claim 12, wherein the expression cassette further comprises a transcription initiation regulatory region and a translation initiation regulatory region that are functional in the tree.

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21. A method of controlling weeds within the vicinity of a tree, comprising applying an imidazolinone herbicide to the weeds and to the tree, wherein the tree has increased resistance to the imidazolinone herbicide as compared to a wild type variety of the tree and wherein the tree comprises an altered AHAS nucleic acid.

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22. The method of Claim 21, wherein the tree is a member of a genus selected from the group consisting of a *Larix* genus and a *Populus* genus.

23. The method of Claim 21, wherein the tree is a *Larix* species selected from the group consisting of: *Larix decidua*, *Larix lyallii*, *Larix kaempferi*, *Larix laricina*, *Larix occidentalis* and hybrids thereof.

24. The method of Claim 21, wherein the tree is a *Populus* species selected from the group consisting of: *Populus angustifolia*, *Populus balsamifera*, *Populus canadensis*, *Populus deltoides*, *Populus fremontii*, *Populus grandidentata*, *Populus tremuloides*, *Populus trichocarpa* and hybrids thereof.

25. The method of Claim 21, wherein the imidazolinone herbicide is selected from the group consisting of: 2-(4-isopropyl-4-methyl-5-oxo-2-imidiazolin-2-yl)-nicotinic acid, 2-(4-isopropyl)-4-methyl-5-oxo-2-imidazolin-2-yl)-3-quinolinecarboxylic acid, 5-ethyl-2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-(methoxymethyl)-nicotinic acid, 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-5-methylnicotinic acid, and a mixture of methyl 6-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-m-toluate, methyl 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)-p-toluate and any derivative thereof.

26. The method of Claim 21, wherein the altered AHAS nucleic acid comprises a polynucleotide sequence selected from the group consisting of:

- a) a polynucleotide as shown in SEQ ID NO:1;
- b) a polynucleotide as shown in SEQ ID NO:2;
- c) a polynucleotide encoding a polypeptide as shown in SEQ ID NO:3;
- d) a polynucleotide comprising at least 60 consecutive nucleotides of any of a) through c); and
- e) a polynucleotide complementary to the polynucleotide of any of a) through d).

21 26. The method of Claim 21, wherein the altered AHAS nucleic acid comprises a polynucleotide as shown in SEQ ID NO:2.

28. The method of Claim 21, wherein the altered AHAS nucleic acid comprises a polynucleotide encoding a polypeptide as shown in SEQ ID NO:3.

29. The method of Claim 21, wherein the altered AHAS nucleic acid is contained within an expression cassette and the expression cassette further comprises a transcription initiation regulatory region and a translation initiation regulatory region that are functional in the tree.